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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/813,799

03/31/2004

Yi-Ling Chen

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05/09/2006

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EXAMINER

NGUYEN, SANG H

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 05/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/813,799

Applicant(s)

CHEN, YI-LING

Examiner

Sang Nguyen

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                    |                                                                             |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____                                                |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>03/31/04</u> .                                                            | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Information Disclosure Statement***

The information disclosure statement (IDS) submitted on 03/31/04 has been entered. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "particles" in claim 1 and 14 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New

Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

Claim 12 is objected to because of the following informalities:

Regarding claim 12 in line 1, the term "according to claim 12" is not clear because it is dependent claim 1 or claim 11.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-7 and 10-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al (U.S. Patent No. 7,006,205) in view of Hwang et al (U.S. Patent No. 6,024,831).**

**Regarding claims 1 and 14-15;** Agarwal et al discloses a method of monitoring of particles generated by a reaction by-product film peeling, the method comprising the steps of:

exciting the particles (col.5 lines 60-65) to emit light (116 of figure 1) by a plasma passes through a window (124 of figure 1), wherein the emitted light (116 of figure 1) having a predetermined wavelength (i.e., a specific wavelength [see col.5. lines 62-65]) associated with the particles (col.5 line 60 to col.6 line24 and table 1); and

measuring intensity values of the light emitted (116 of figure 1) at the predetermined wavelength over a predetermined time period by a spectrometer (120 of figure 1 and col.5 lines 40-45); and

comparing the measured intensity value of the emitted light (116 of figure 1) with a correct plasma characterization by a neural network (122 of figure 1). See figures 1-13.

U.S. Patent Feb. 28, 2006 Sheet 1 of 12 US 7,006,205 B2

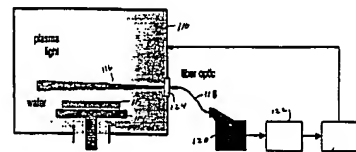


FIG. 1

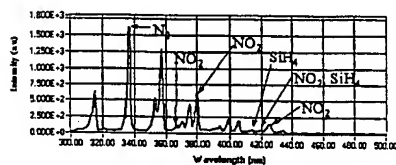


FIG. 2

U.S. Patent Feb. 15, 2000 Sheet 1 of 9 6,024,831

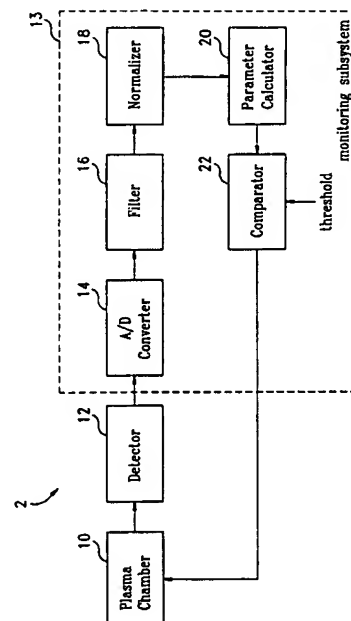


FIG. 1

Agarwal et al discloses all of features of claimed invention except for comparing the intensity value of the light, measured at a selected time during the predetermined time period, to a predetermined light intensity threshold value wherein if the intensity value of the light measured at the selected time is above the predetermined light intensity threshold value, the chamber condition is abnormal. However, Hwang et al teaches that it is known in the art to provide method for monitoring plasma chamber conditions comprises a monitoring subsystem (13 of figure 1) coupled to a detector spectrometer (12 of figure 1), wherein the monitoring subsystem (13 of figure 1) having a comparator (22 of figure 1) and a parameter calculator (20 of figure 1) for comparing the measured intensity value of the light from detector (12 of figure 1) at a selected time during the predetermined time period to a predetermined light intensity threshold value (col.1 lines 50-52 and figure 1) wherein if the intensity value of the light measured at the selected time is above the predetermined light intensity threshold value, the chamber condition is abnormal (col.1 line 50 to col.2 line 2; col.3 line 55 to col.4 line 10; and col.5 line 45 to col5 line3). See figures 1-6.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method in situ monitoring of particles with comparing the intensity value of the light, measured at a selected time during the predetermined time period, to a predetermined light intensity threshold value wherein if the intensity value of the light measured at the selected time is above the predetermined light intensity threshold value, the chamber condition is abnormal as

taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma.

**Regarding claims 2 and 16;** Agarwal et al discloses all of features of claimed invention except for the comparing step if the intensity value of the light is equal to or below the predetermined light intensity threshold value, the chamber condition is normal. However, Hwang et al teaches that it is known in the art to provide the comparing step if the intensity value of the light is equal to or below the predetermined light intensity threshold value, the chamber condition is normal (figures 3 and 4D and col.2 lines 15-16)). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method in situ monitoring of particles with the comparing step if the intensity value of the light is equal to or below the predetermined light intensity threshold value, the chamber condition is normal as taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma.

**Regarding claim 3;** Agarwal et al discloses the selected time during the predetermined time period (figures 6 and 9). Agarwal et al discloses all of features of claimed invention except for the selected time about one-half the predetermined time period. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method in situ monitoring of particles with the selected time about one-half the predetermined time period, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

**Regarding claim 4;** Agarwal et al discloses all of features of claimed invention except for the exciting step is performed by generating RF power within the chamber. However, Hwang et al teaches that it is known in the art to provide generating RF power within the chamber (col.2 lines 28-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method in situ monitoring of particles with generating RF power within the chamber as taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma in IC fabrication processes.

**Regarding claim 5;** Agarwal et al discloses all of features of claimed invention except for further performed by pumping a process gas into the chamber. However, Hwang et al teaches that it is known in the art to provide performed by pumping a process gas into the chamber (col.2 line 28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method in situ monitoring of particles with performed by pumping a process gas into the chamber as taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma in IC fabrication processes.

**Regarding claim 6;** Agarwal et al discloses the measuring step is performed by observing the emitted light by an optical emission spectrometer (118, 120 of figure 1).

**Regarding claim 7;** Agarwal et al discloses the semiconductor fabrication apparatus comprises a plasma etching apparatus (col.11 lines 24-35).



**Regarding claim 10;** Agarwal et al discloses the predetermined wavelength is about 703 nanometers (col.6 lines 1-20 in dicated wavelength may be 300 nm to 750 nm and figure 2).

**Regarding claim 11;** Agarwal et al discloses further comprising the step of storing the intensity value of the light measured of spectrometer (120 of figure 1) at the selected time in a trend file by a neural network (122 of figure 1).

**Regarding claim 12;** Agarwal et al discloses further comprising the step of graphically displaying the intensity value of the light stored in the trend file on a user interface (figures 5-6 for indicating intensity light of training set 571, validation set 573, and test set 575).

**Regarding claim 13;** Agarwal et al discloses using data obtained from the trend file for inline process control by a controller system (130 of figure 1).

**Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al in view of Hwang et al as applied to claims 1 and 7 above, and further in view of Wong et al (6815362).**

**Regarding claims 8-9;** Agarwal et al in view of Hwang et al discloses all of features of claimed invention except for the exciting step is a stage of a waferless auto-clean cycle of the apparatus. However, Wong et al teaches that it is known in the art to provide a stage of a waferless auto-clean cycle of the apparatus (figure 10). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method in situ monitoring of particles with the exciting

step is a stage of a waferless auto-clean cycle of the apparatus as taught by Wong et al for the purpose of removing previously deposited chamber residues which has accumulated on interior surface of chamber.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yamartino et al (6635577) discloses method for reducing topography dependent in a plasma; Nakata et al (6355570) discloses semiconductor manufacturing method; Hwang et al (6157867); Le et al (6153115) discloses monitor of plasma process; Tomioka (5810963) discloses plasma processing apparatus and method; Imatake et al (5759424) discloses plasma processing apparatus and method; Ghanayem (5552016) discloses method and apparatus for etchback endpoint detection; Chen et al (4493745) discloses optical emission spectroscopy end point detection in plasma etching.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sang Nguyen whose telephone number is (571) 272-2425. The examiner can normally be reached on 9:30 am to 7:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

May 6, 2006

SN

  
**Sang Nguyen**  
**Patent Examiner**  
**Art Unit 2877**